PROPOSED NEW CLAIMS

20. A strain sensor, comprising: an optical waveguide having a plurality of reflecting structures spaced lengthwise along the waveguide, each reflecting structure having a reflectivity for reflecting light at a different characteristic wavelength which changes in dependence upon a change of physical length of at least part of the respective reflecting structure, the reflectivity of reflecting structures which reflect at characteristic wavelengths which are adjacent to each other being different for discriminating between adjacent reflecting structures.

A1

21. The strain sensor according to claim 20, in which the reflecting structures which reflect at adjacent wavelengths are configured such that one of the reflecting structures reflects the light at one characteristic wavelength, and the reflecting structure adjacent in wavelength is configured to reflect the light at two characteristic wavelengths.

22. The strain sensor according to claim 21, in which the reflecting structure which reflects the light at two wavelengths is configured such that the two characteristic wavelengths are separated by at least a width of the reflectivity of the reflecting structure which reflects at the adjacent wavelength.

23. The strain sensor according to claim 20, in which the optical waveguide comprises an optical fiber.

24. The strain sensor according to claim 20, in which each reflecting structure comprises a grating structure having a pitch, and wherein a change in the characteristic wavelength is in consequence of a change in the pitch of the grating structure.

25. The strain sensor according to claim 24, in which each grating structure comprises a Bragg grating.

26. The strain sensor according to claim 24, in which the optical waveguide is an optical fiber that includes a photo-refractive dopant, and in which each grating structure is optically written into the optical fiber.

27. The strain sensor according to claim 26, in which the optical fiber comprises silica doped with germanium oxide.

28. An apparatus for measuring strain, comprising: a strain sensor including an optical waveguide having a plurality of reflecting structures spaced lengthwise along the waveguide, each reflecting structure having a reflectivity for reflecting light at a different characteristic wavelength which changes in dependence upon a change of physical length of at least part of the respective reflecting structure, the reflectivity of reflecting structures which reflect at characteristic wavelengths which are adjacent to each other being different for discriminating between adjacent reflecting structures; a light source operable for applying the light to the waveguide, the light having a wavelength range which covers at least a range of wavelengths over which the reflecting structures reflect; and detector means for determining a change of characteristic wavelength at which the reflecting structures reflect light, the change being indicative of a change in length of at least a part of the respective reflecting structure.

29. The apparatus according to claim 28, in which the detector means determines the change in characteristic wavelength by measuring the wavelengths at which the strain sensor reflects the light.

30. The apparatus according to claim 28, in which the detector means measures the light transmitted by the strain sensor and determines the change of characteristic wavelength by measuring the change in wavelength at which light transmission is attenuated.

31. The apparatus according to claim 28, in which the detector means further comprises means for utilizing a relative magnitude of an intensity of reflected light or a relative magnitude of an intensity at which light transmission is attenuated to discriminate between the reflecting structures which are adjacent in wavelength.

A1 cont.

32. A method of measuring strain, comprising the steps of: providing a strain sensor including an optical waveguide having a plurality of reflecting structures spaced lengthwise along the waveguide, each reflecting structure having a reflectivity for reflecting light at a different characteristic wavelength which changes in dependence upon a change of physical length of at least part of the respective reflecting structure, the reflectivity of reflecting structures which reflect at characteristic wavelengths which are adjacent to each other being different for discriminating between adjacent reflecting structures; applying the light to the waveguide, the light having a wavelength range which covers at least a range of wavelengths over which the reflecting structures reflect the light; and detecting a change in the characteristic wavelength at which the reflecting structures reflect the light.

33. The method according to claim 32, and further comprising the step of detecting the change in the characteristic wavelength by measuring the wavelengths at which the strain sensor reflects the light.

34. The method according to claim 33, and further comprising the step of detecting the change in the characteristic wavelength by measuring the wavelengths at which the transmission of the light through the strain sensor is attenuated.

35. The method according to claim 34, and further comprising the step of detecting a relative magnitude of an intensity of reflected light or a relative magnitude of an intensity

at which transmitted light is attenuated to discriminate between the reflecting structures which are adjacent in wavelength.

36. The method according to claim 32, and further comprising the step of sweeping the wavelength of the light applied to the strain sensor.

37. The method according to claim 32, in which, when it is desired to measure the strain within an object, further comprises the step of securing a part of the waveguide having at least a part of one of the reflecting structures to the object such that a change in a physical length of at least a part of the object causes a change in a physical length of at least the part of the one reflecting structure.

Cont'd.

38. The method according to claim 32, in which, when it is desired to measure a temperature of an object, further comprises the step of placing a part of the waveguide having at least a part of one of the reflecting structures in thermal contact with the object such that a change in the temperature of the object causes a change in the physical length of at least the part of the one reflecting structure.